ENVIRONMENT PROTECTION BOARD

BUILDING A GAS PIPELINE THROUGH THE ARCTIC

WHAT ABOUT THE FISHES?

The Fishes

Aquatic Environments

The proposed gas pipeline route along the Mackenzie Valley transportation corridor will cross a variety of aquatic environments, including the Mackenzie River which drains a basin of 700,000 square miles. The drainage basin of this great river encompasses a wide range of wetlands, from streams and lakes of the boreal forest in the south to saltwater channels and lakes of the Mackenzie Delta in the north. All these environments, from flowing waters to still waters and from fresh to salt, provide habitat for fishes.

Depending on the route finally chosen, the gas pipeline may also cross drainage basins of the Yukon River or rivers flowing to Beaufort Sea along the arctic coast west of the Mackenzie Delta. The Yukon is a major river system that flows to the Pacific Ocean. Rivers along the Arctic coast west of the Mackenzie delta are individually smaller but of quite different character than the major river systems along the proposed routes. These drainage basins support different kinds of habitat and different species of fish.

Kinds of Fishes

More than thirty species of fish were taken in the Mackenzie River drainage basin during studies carried out by the Environment Protection Board. Although not a large number in comparison with more southerly river systems, this is a substantial number of species for this latitude. The distribution of some of the species is also quite wide. The fact that the Mackenzie River carries relatively warm water from south to north results in some of the fishes extending their ranges further north.

The Yukon and West Coastal drainage basins apparently contain fewer species of fish than the Mackenzie drainage basin. Their importance is enhanced however, by the abundance of certain valued species such as salmon and arctic char.

Age and Growth

Examination of scales from northern fishes shows that growth of fishes from all these drainage basins is slow. Typically the range of ages in populations is wide and individual fish grow to larger sizes than further south. The slow growth and large range of ages is also associated with late sexual maturity. Thus, although the large sizes are at first impressive, it takes years to grow to those sizes and these older and larger fish are needed to continue reproduction of the species. These are important considerations in determining pipeline impact.

Spawning and Migrations

Spawning runs and migrations of northern fishes are critical phases of their life history in terms of potential development effects. Unfortunately, they are not well known at the present time.

Chronology and locations of spawning are not well defined for any of the northern species of fish. The time between deposition of fertilized eggs in stream gravels and emergence of newly hatched fry is a particularly sensitive one for fish reproduction. Developing eggs and larvae require oxygenated water for development. Increased siltation or other changes which would reduce this oxygen supply could be detrimental to early development of fish. To protect fishes at this stage of their life history, locations of spawning areas and times of spawning must be known.

Timing and locations of fish migrations also must be better understood. Migrations are usually related to spawning activities when the fish are moving to or from their spawning grounds. Interference with these migrations could reduce spawning success and endanger future reproduction.

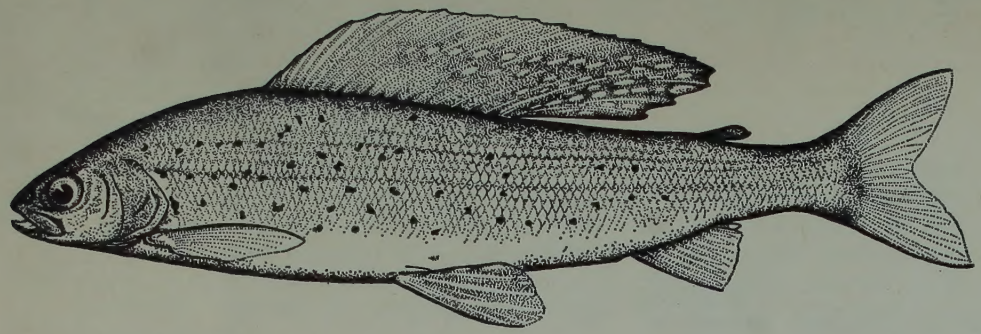
One further critical phase of fish life history is growth of young fry shortly after their emergence from spawning gravels. In some cases, nursery areas are utilized by the fish during this period. Locations of these nursery areas and duration of their use must be better understood in northern areas.

Use

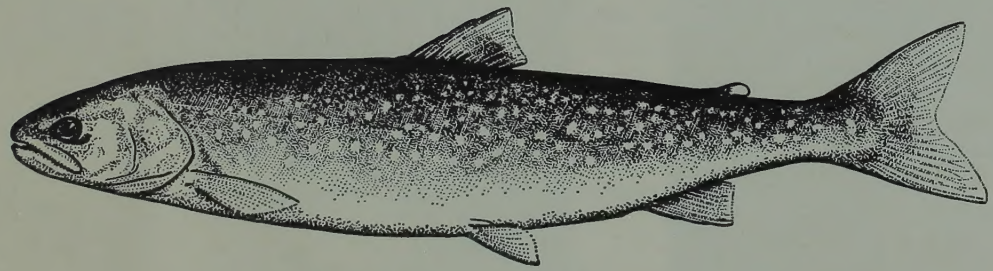
The use of the fishery resources of the North is an important consideration. Former exploitation of fishes for domestic and subsistence fishing is diminishing with the reduction in use of dogs and changing traditions. In spite of these changes, however, traditional use of the fish resources by natives will continue to be an important cultural part of their lives.

At the same time, recreational use of northern fish resources is accelerating as urban social pressures increase and access to remote areas improves. Greater numbers of people in northern areas will exact a greater impact on fish resources of the region.

To meet the continuing traditional demands and increasing recreational demands, a better understanding of the fish resources and proper regulations will be required.



Arctic grayling (above) are distinguished by their long dorsal fins and rainbow coloration. Grayling are prized by sport fishermen. In spring they spawn over gravel beds in shallow water. They are found throughout northern watersheds along the proposed gas pipeline routes. Maximum size is about 24 inches.



Arctic char (above) although freshwater spawners, typically spend eight years at sea. They return to streams and spawn in nests built in gravel beds. Char are most common in rivers along the arctic coast, although landlocked populations are also known. They are prized by sport fishermen and are an important food for natives and their dogs. Maximum size is about 38 inches, less in western regions.

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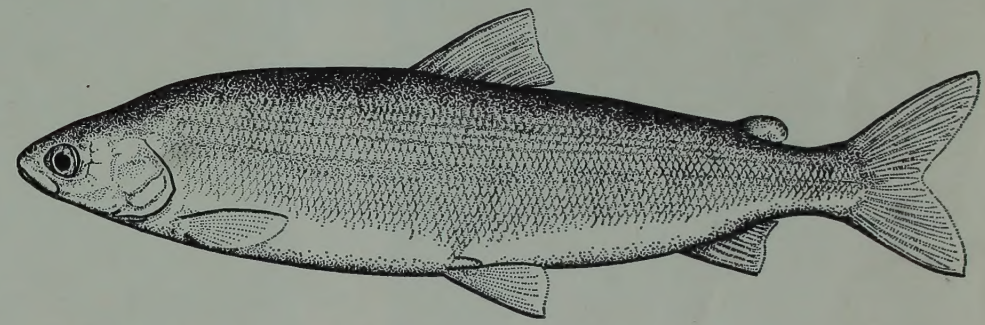
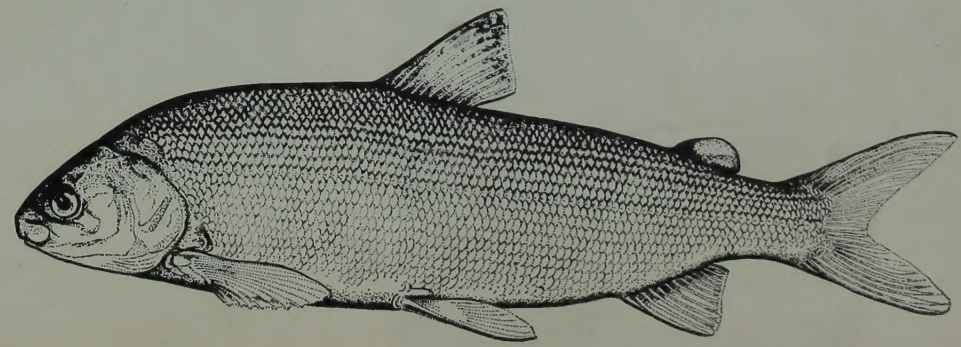
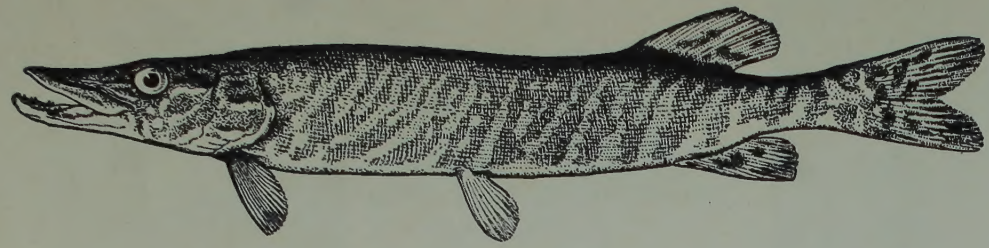
Arctic ciscoes (below) are one of several kinds of whitefish found in the North. They migrate from the sea up the Mackenzie River in spring and spawn in fall. Downstream migrations occur between freeze-up and mid-winter. Arctic ciscoes are caught in large numbers in Arctic Red River and are an important source of food for native people. Maximum size is about 25 inches.



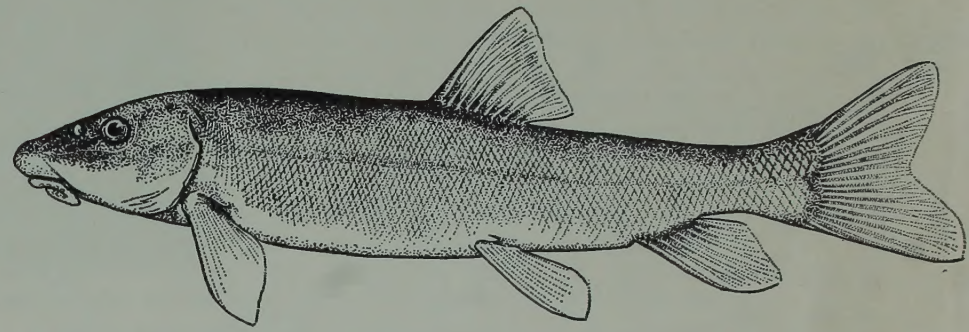
Broad whitefish (below), taken throughout the North, are distinguished by their blunt noses. Fall spawners, broad whitefish are widely utilized as human and sled dog food. Maximum size is about 27 inches.





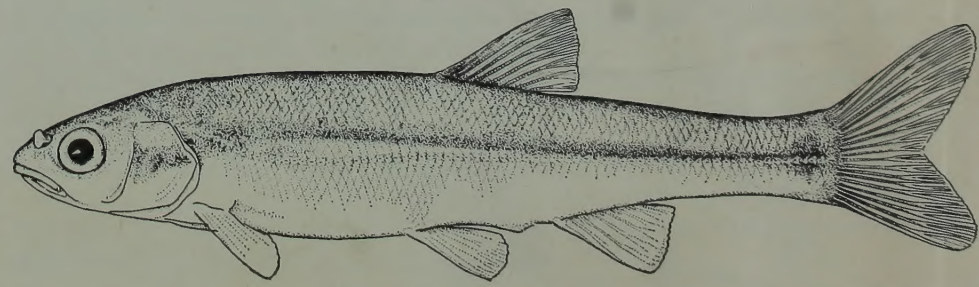
Northern pike (above) are found throughout the North in shallow lakes and quiet rivers. They are efficient predators, feeding primarily on other fish and small mammals. They spawn in spring in flooded marshes. Their eggs are adhesive and cling to vegetation until they hatch. Large northern pike are sought as trophies by some sport fishermen. Maximum size is more than 48 inches.

Longnose suckers (below) are common in northern streams and lakes. As bottom scavengers, they comprise an important segment of aquatic ecosystems and are widely used as dog food, bait and occasionally as human food. Suckers spawn in spring along shores of lakes and streams. Maximum size is about 25 inches.



Burbot (above) are freshwater members of the cod family. They are easily recognized by their elongated, tapered bodies and whisker-like barbels beneath their mouths. Spawning occurs in winter on sandy lake and stream beds. Livers of burbot are rich in oils and have been used for medicinal purposes in the North. Maximum size is about 48 inches.

Lake chubs (below) are small fishes found in a wide variety of aquatic habitats from clear lakes to muddy streams. Eggs are scattered over rocks along shores of lakes and streams. Chubs form an important food base for larger fish.



Fishes and a Gas Pipeline

Pipeline Activities

Design, construction and maintenance of a gas pipeline from Prudhoe Bay to Alberta is a complex engineering and managerial challenge. The complexity of the project is further increased by the need to protect biological communities along the route from potentially detrimental effects associated with the project. Aquatic life, including fishes, is among the major ecological concerns of development.

Before construction of the pipeline begins, important decisions must be made which will have consequences for fishes. Location of a transportation corridor, conceived by the federal government, within which the pipeline route may be placed is one such critical decision. Other facilities envisioned within the transportation corridor, including a road, railroad and another pipeline and their relative locations are also critical, singly and in combination.

Other pre-construction activities include location of associated facilities such as pumping stations, construction staging areas, borrow pits, roads and airstrips. Careful selection of these locations can reduce impact on fishes considerably.

After environmentally informed pre-planning, the construction phase is perhaps the single most critical period for environmental protection along the route. Construction activities must be carefully timed to avoid crucial life history phases of fishes. Construction procedures must be monitored and the large number of workers employed on the project educated and controlled to protect the environment.

Operation and maintenance procedures, like design, must be carefully planned and controlled to protect aquatic systems along the route. Plans and procedures for any ultimate abandonment of the line should also be part of preliminary project planning.

Possible Effects on Fishes

Potential detrimental effects of gas pipeline activities on fishes center on critical life history stages. Increased siltation that clogs gills of adult fish or smothers fish eggs or larvae must be avoided. In addition to the pipeline project, an all-weather highway is planned and partly constructed along the Mackenzie River Valley. Massive amounts of gravel will be required for this highway and airstrips, staging areas, compressor station sites, pumping stations, roads and other facilities directly associated with the pipeline. Preliminary estimates of gravel requirements for all these facilities exceed 100 million tons. Removal of gravel from riverbeds for construction of such facilities must be carefully regulated to sustain the spawning potential of fish stocks.

Migrations are an integral part of spawning behavior of many fish species. Any activities which would block, divert or increase the velocity of water in streams and consequently interfere with spawning migration, must be scrutinized. Culverts, for example, must not increase water velocities to the point that spawning migrations are interrupted for long periods. Ice bridges and river crossing approaches pose still other problems. The limited hydrological information available to the Environment Protection Board indicates that many of the streams which may be crossed by the proposed pipeline do not flow in the winter. This means that winter construction activity may have less impact on fishes than summer construction.

Introduction of foreign materials to streams and lakes must be avoided. These materials may include herbicides, pesticides, line-testing fluids, domestic wastes, garbage and fuel oils. Watercourses in the North cannot degrade significant quantities of these substances and they would merely accumulate in the ecosystem.

Finally, fish populations must be protected from excessive human exploitation which will result as access to the North improves. Use of fish resources will have to be carefully regulated to prevent over-exploitation.

Studies of Fish

Several groups, both inside and outside government are studying fish in watercourses that may be affected by the proposed gas pipeline. Considerable effort has been expended to provide both baseline data and specific, problem-oriented information needed to protect fish resources.

Approaches to data collection by the various groups have varied somewhat but a preliminary bank of data is emerging. In 1971 and 1972 the Environment Protection Board surveyed approximately 700 streams which may be crossed by the proposed pipeline. At 160 of these fish and water samples were taken. Final appraisal of potential effects on the fisheries by pipeline construction and operation, based on only two summers of work, can only be tentative, however.

Completion of the assessment of environmental impact of the proposed gas pipeline will depend on detailed integration of ecological data with engineering information from personnel involved in design and construction of the project. Only with the amalgamation of ecological and engineering information can environmental design, impact assessment, control of workers and post-construction evaluations be completed.

4. Babbage River is another of the arctic coastal rivers that provides feeding and spawning areas for arctic char.

5. Small coastal streams west of the Mackenzie Delta are important fish habitat in summer.

6. The Mackenzie Delta is dotted with lakes and channels that may contain freshwater or saltwater, depending on local conditions and season.

7. A field crew of biologists seines for fish in Old Crow River. Species here include grayling, arctic ciscoes, broad whitefish, northern pike, lake chubs and longnose suckers.

3. Firth River shows the wide and braided flood plain typical of the larger rivers along the arctic coast of Yukon Territory and Alaska.

2. A fish reconnaissance group works Arctic Red River. Arctic ciscoes spawn in great numbers in this river just after freeze-up.

1. Scale samples from a fish taken from Hume River are aged by a biologist. Age data, coupled with other information are used to determine growth rates. The inset shows a scale from a grayling in its third year.

8. Water samples from Old Crow River are examined for oxygen content, pH and natural suspended sediments. Interpretation of such data enables fish biologists to determine the water quality of fish habitats.

9. A fisheries crew seines the scenic Rat River. Such swift-flowing streams are important for production of fish, such as those in the inset.

10. From examination of specimens from the Mackenzie River region we are learning more about fish food habits and reproduction.

Fishing in the Arctic still provides food for humans and their sled dogs. Here Peter Lord of Old Crow tends a gill net, removing the catch, chum salmon.

(Photos by G. Calef)

With his catch on shore, Peter Lord prepares the salmon for cleaning and drying. Communities along the proposed pipeline route consume thousands of pounds of various fish species annually.

Peter Lord cleans salmon by splitting each fish along the belly. Not much is wasted — the flesh and roe are consumed by humans and the viscera is eaten by dogs.

During cleaning the salmon are scored on the sides and hung to dry. After drying they are smoked over a slow-burning poplar wood fire. Once properly cured they are baled and stored for future use.

Environment Protection Board

In 1970 the Environment Protection Board began studying effects on the natural environment of construction and operation of a natural gas pipeline through the Yukon and Northwest Territories. The study involves collecting baseline data, incorporating environmental planning into pipeline design, assessing impact, preparing guidelines for education and control of construction personnel and evaluating post-construction activities. The Board, now sponsored by Canadian Arctic Gas Study Limited, is composed of specialists in Arctic research or environmental science.

The Board, an autonomous body, is guided by the following objectives:

1) To become sufficiently familiar with arctic ecosystems in the area of pipeline operation to permit estimates of biological costs or benefits of construction and judgments about the potential for widespread damage or major disruption of ecosystems.

2) To become sufficiently familiar with biological and physical environments so that pre-construction findings can be used as a basis for post-construction evaluation.

3) To make recommendations and conduct briefings so that results of the Board's deliberations can be used for maximum environmental protection.

4) To make available results of its studies as a direct contribution toward northern scientific development.

The Board's deliberations are to continue throughout the life of the proposed four-year construction project and for a suitable period during the operational phase.

Members of the Environment Protection Board are: Mr. C.H. Templeton (Chairman), Dr. L.C. Bliss, Dr. M.E. Britton, Mr. D.W. Craik, Mr. E. Gourdeau, Dr. I. McTaggart-Cowan, Dr. S. Thomson, Dr. N.J. Wilimovsky and Mr. R.C. Isaak (Secretary).

Outside specialists are used for specific assignments. Administrative support for the Board is supplied by Interdisciplinary Systems Ltd., 528 St. James Street, Winnipeg, Manitoba.

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